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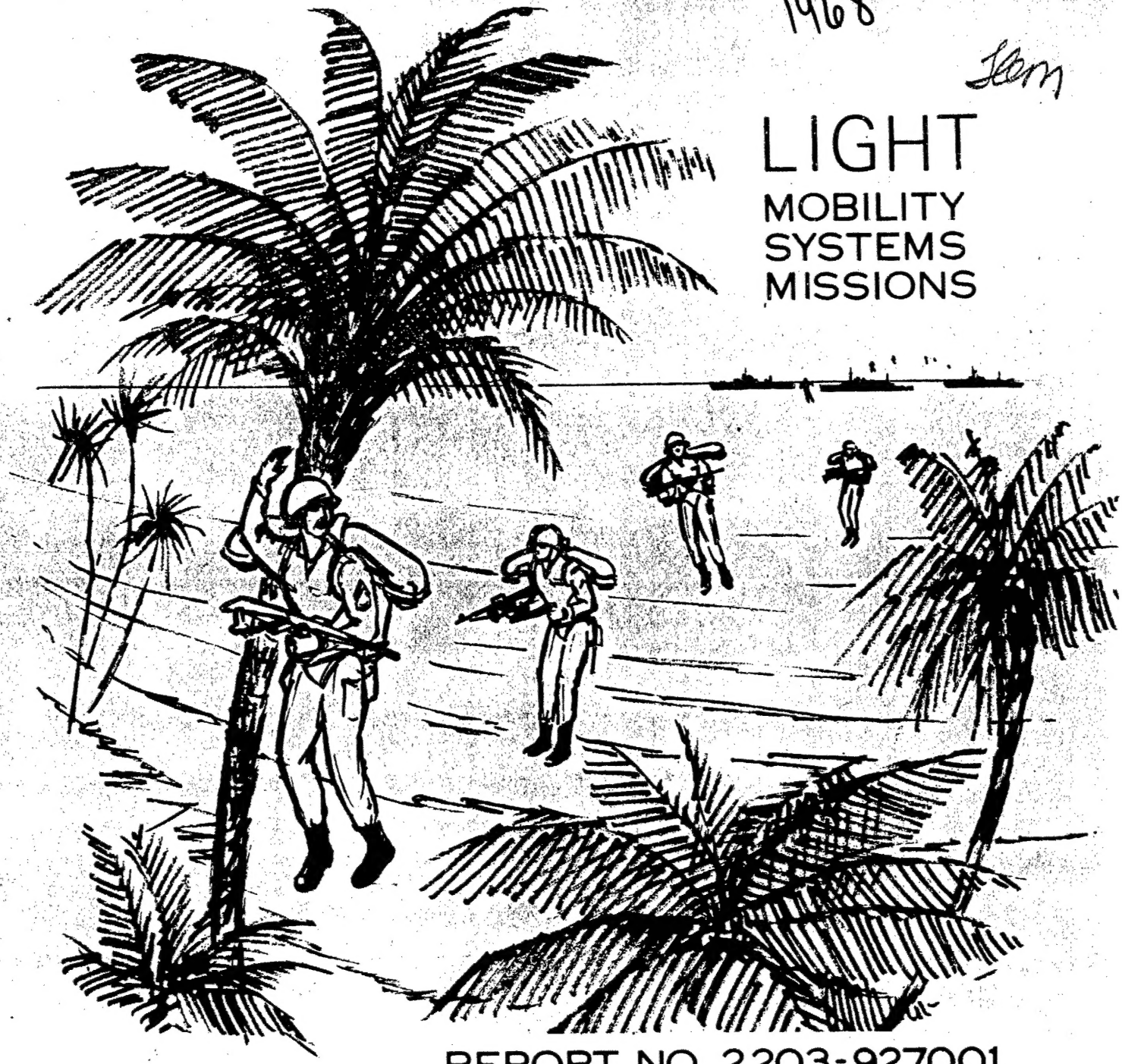
1968

Item

LIGHT MOBILITY SYSTEMS MISSIONS



REPORT NO. 2203-927001

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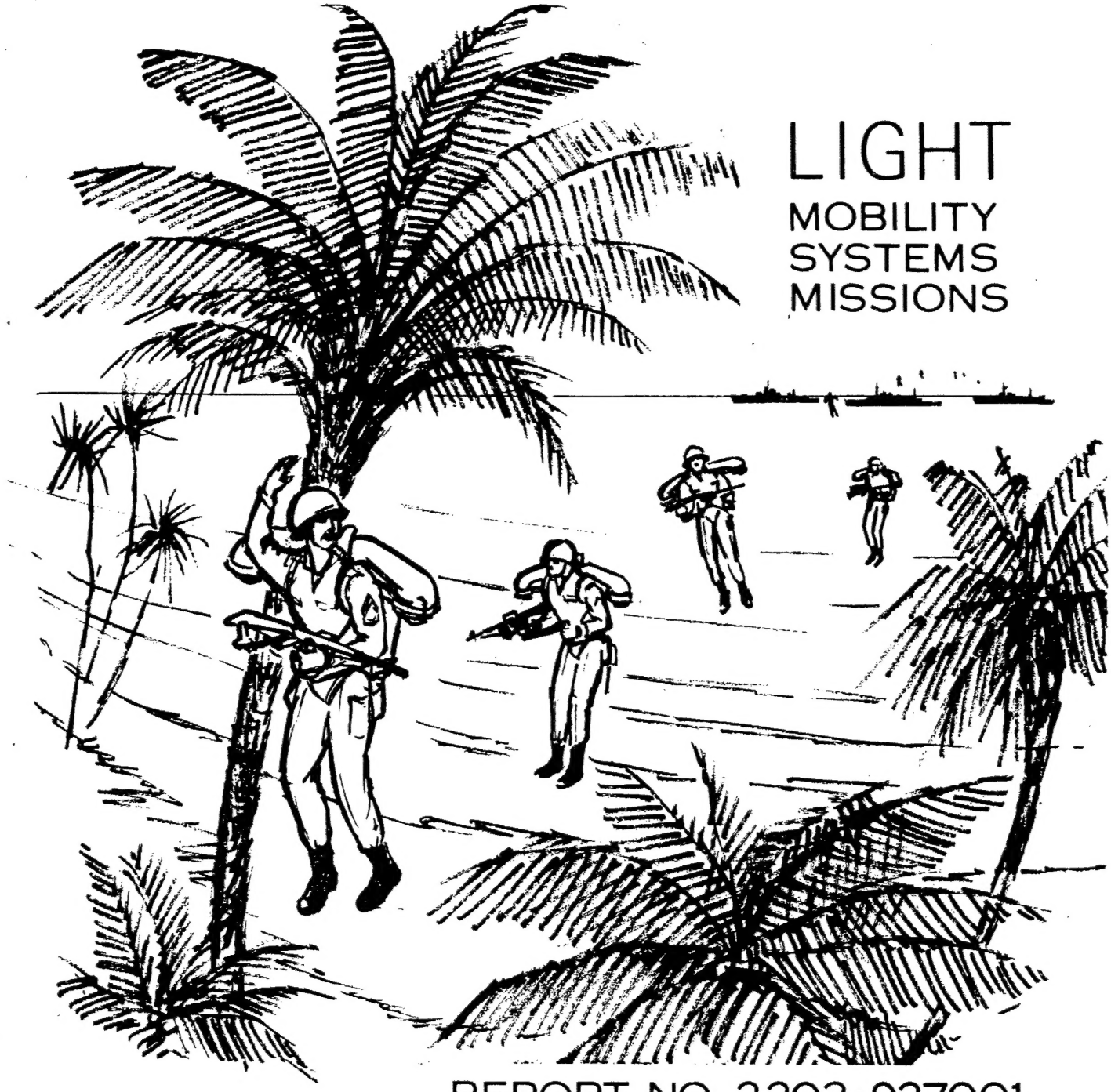

LIGHT MOBILITY SYSTEMS MISSIONS

REPORT NO. 2203-927001

BELL AEROSYSTEMS -A textron COMPANY

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ILLUSTRATIONS

I. INTRODUCTION

Bell Aerosystems is conducting a study to determine the characteristics most desired in a military Light Mobility System (LMS). This system will use the control concepts of the Bell Rocket Belt plus the advantages of jet turbine power. This Belt has successfully completed over 3000 flights. The Jet Belt, scheduled to fly in April 1968, will be far superior to the Rocket Belt in both range and endurance. (Figures 1, 2 and 3).

In order to continue the development of this concept we must be better acquainted with the mission requirements of an LMS. Your assistance is requested in answering the enclosed questionnaire. Your expert opinions and comments will be greatly appreciated.

The family of Light Mobility Systems being studied includes small one-man systems such as the Jet Belt and the POGO, and larger systems such as the two-man POGO and a configuration with skid type landing gear.

Light Mobility Systems will have the following general characteristics:

Crew:	one operator
Length:	between 3 ft and 6 ft
Height:	approximately 6 ft
Maximum speed:	in excess of 100 mph
Speed range:	all speeds from hover to maximum
Maneuverability:	excellent in all flight conditions
Powerplant:	jet turbine
Landing area:	unprepared area large enough to contain its size:
Payload:	from 10 pounds in the smaller system to 250 pounds in the larger system

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Figure 1. Bell Jet Belt

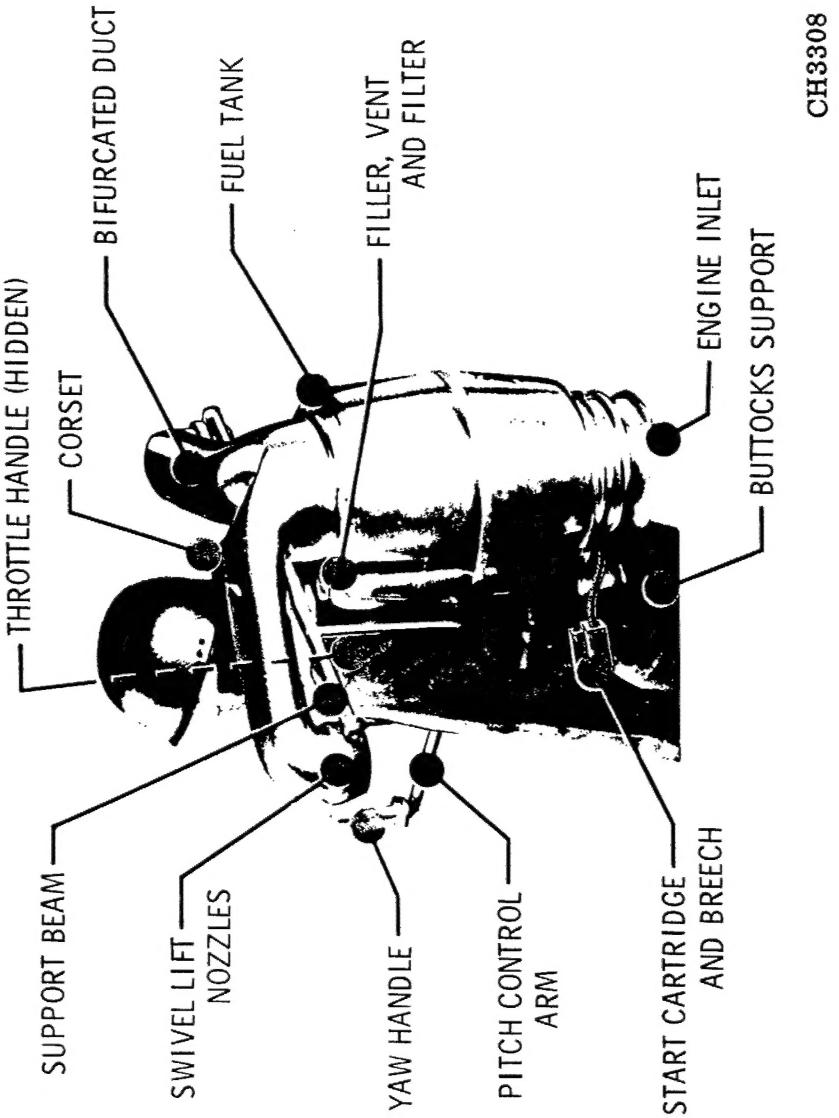

Figure 2. Jet Belt Components

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Figure 3. Bell Rocket Belt, Predecessor to the Bell Jet Belt

A tradeoff occurs between such variable characteristics as payload and airspeed. The LMS can carry as large a payload as desired or travel as fast or as far as desired; however, as the performance increases, the size, complexity, and cost also increase. The most cost effective LMS will naturally be the smallest system which could accomplish the mission. When the characteristics desired for each mission are determined, various Light Mobility Systems will be examined to determine the preferred size.

This report will acquaint you with a few of the many potential missions which could be effectively performed. Potential missions in the five functional areas of combat are presented in this report.

When you have finished reading this report, complete the questionnaire in the envelope at the back of the book, and return it in the self-addressed envelope to Bell Aerosystems Company. Thank you for your cooperation.

II. INTELLIGENCE

A. RECONNAISSANCE

Reconnaissance missions are performed to collect specific information such as enemy strength, disposition and activities, and terrain characteristics. Since specific areas and/or boundaries are assigned, the operator must have a navigational capability of locating and map-coordinating the proper area and returning to his organization. This capability also is required to provide the grid-coordinate geographic locations of identified targets (See Figure 4).

This system is capable of operating over a greater distance in less time than is possible with the ground reconnaissance patrol. It would provide a more responsive means of determining and verifying intelligence which cannot be obtained as rapidly by higher level resources. Included are missions such as providing point and flank security for moving elements. Operations would extend beyond the FEBA, so vulnerability would be a consideration, however the LMS presents a small, fast target, capable of evasive maneuvers.

Four steps are required to perform reconnaissance missions:

(1) Search to Detect Targets and Activity - This can be performed visually or with photographic, chemical or electronic equipment. Binoculars or night vision devices may be utilized.

(2) Recognition or Identification of Sighted Targets - This task will normally be performed by the LMS operator; however, when photographic or electronic equipment is used it may be performed by ground personnel.

(3) Determination and Verification of Target Location - The operator can accomplish this if he knows his location at the time the target is detected. Location can be established by ground personnel if the flight is monitored from the ground or is recorded. The target could be marked by smoke at the time of recognition, providing an immediate visual location marker.

(4) Report Target to Initiate Counteraction - This task must be performed rapidly because of enemy target movement or imminent danger to friendly forces.

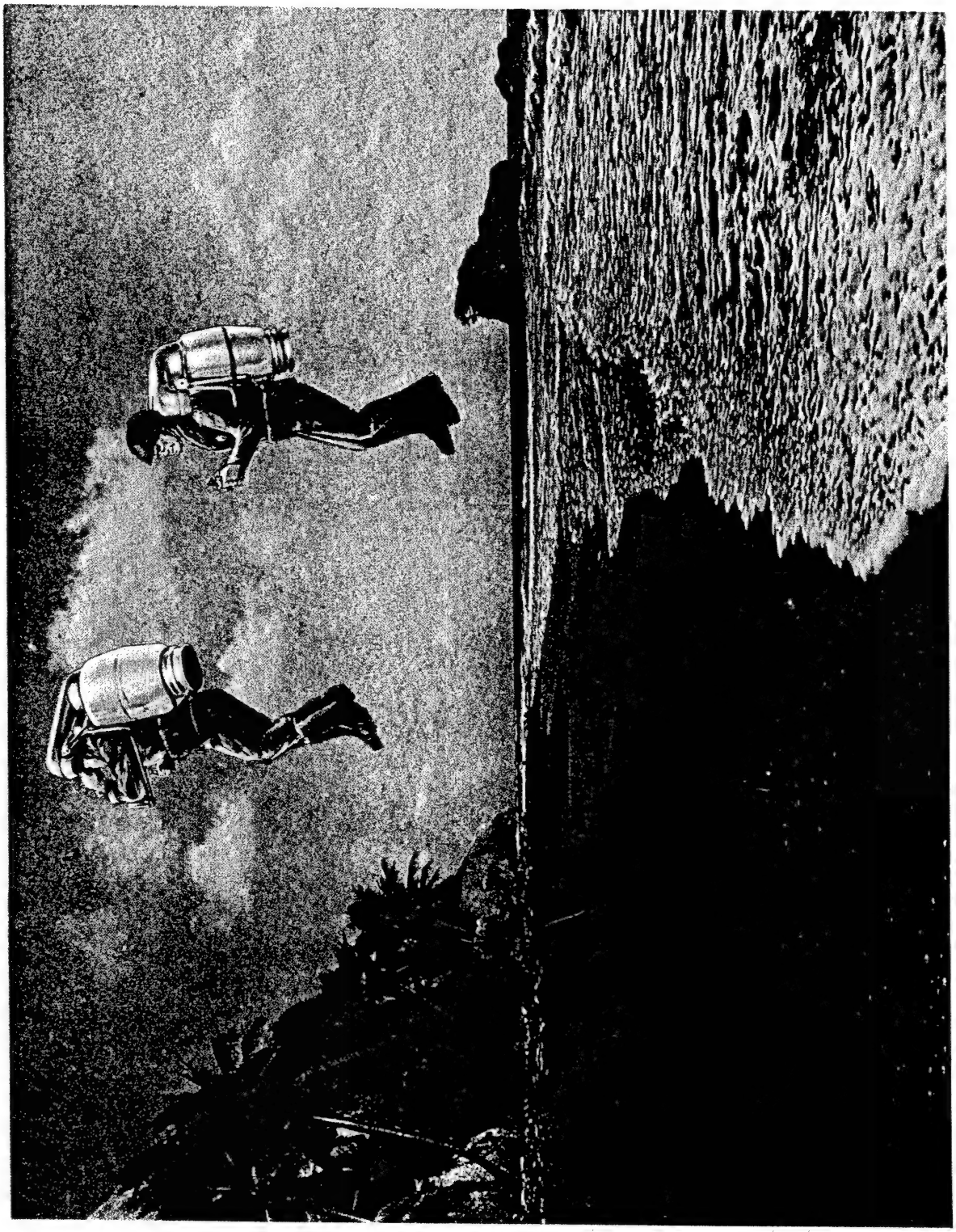

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Figure 4. Reconnaissance or Hit-and-Run Missions

The operator may report the location by radio, prearranged signals or personal contact. If the recognition were accomplished by ground personnel, they would also report the target. Much intelligence value would be lost by the time delay unless an effective real-time system were developed and utilized.

1. Armed Reconnaissance

In this type of reconnaissance, machineguns or rockets are fired at suspected enemy locations. This technique has been very effective, but a lightweight armament system having little recoil would be required.

2. Visual Reconnaissance

This mission would be accomplished by the operator visually scanning the terrain. The visual search could be aided by using binoculars and/or night vision devices; however, this may require an automatic stabilization system to allow for hands-off flight. Light filters may also be used to aid in camouflage penetration. (Figure 5)

3. Photographic, Electronic and Chemical Reconnaissance

This mission would utilize more sophisticated detection equipment such as cameras, infrared, radar, television and chemical analysis.

Some of the currently available equipment requires extensive ground support which may not be acceptable at the lower organizations, such as the infantry battalion. Some of the equipment is heavy and may require automatic stabilization equipment to provide a stable platform. The detection system selected should be lightweight, simple, durable, reliable and require little or no ground support.

A polaroid camera is a simple, responsive, lightweight system which would not require ground support and would thus be acceptable. New motion picture processing equipment which is simple, automatic, and requires minimal ground support is now available, making the use of an airborne movie camera possible and practicable.

The use of real time television could be quite advantageous if the ground equipment is not too restrictive.

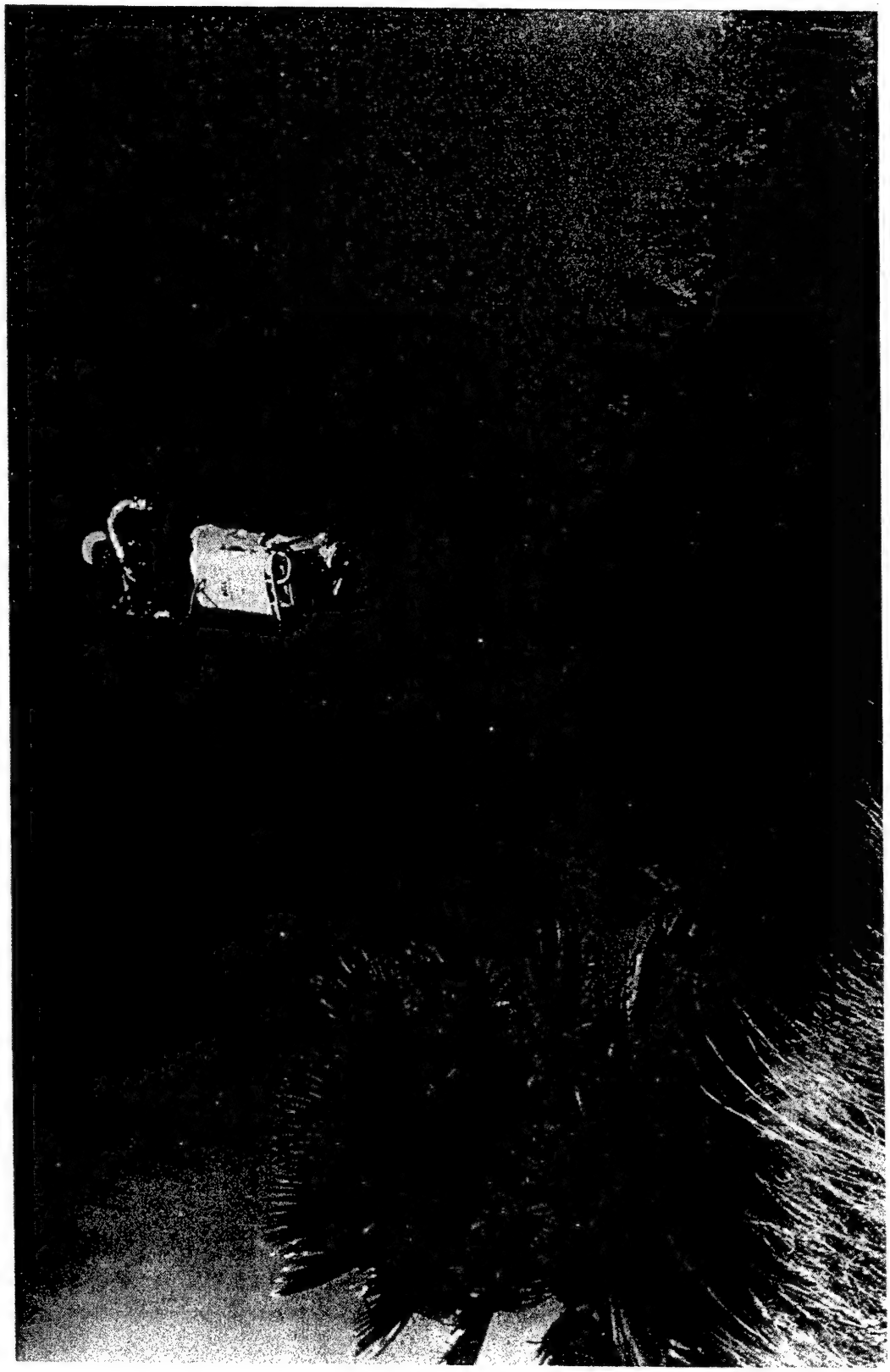

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Figure 5. POGO Rocket Concept is Flexible

The "people sniffer" has been employed successfully with helicopters in Vietnam to detect enemy personnel. This system should be effective when used with the LMS.

B. OBSERVATION POST

The LMS can be employed as an aerial observation post (Figure 6), or a means of moving a forward observer to high ground or to otherwise inaccessible locations. The capability of moving the observer rapidly to a new accessible position can be invaluable to the unit commander. It could be organic to the lead tank of an armored element thereby becoming the "eye" of the force (Figure 14). If the radius of operation is small, a navigational capability may not be necessary. Automatic stabilization may be required if observations are to be accomplished while in the air, using binoculars or night vision devices. It may also be required when employing electronic detection equipment such as radar, infrared or television, while airborne. However, all missions performed while on the ground and aerial unassisted visual missions would not require automatic stabilization.

This mission could be performed beyond or in close proximity to the FEBA and therefore vulnerability would be a required consideration.

C. MAINTAIN CONTACT WITH FRIENDLY FORCES

During rapidly moving combat operations it is sometimes extremely difficult to maintain contact with friendly units on the flanks. Without contact, flank security can be compromised and a flank attack or infiltration by enemy units is always possible. The LMS would permit rapid contact at any time the unit boundary is in doubt, and would if necessary allow contact to be maintained. (Figure 11.)

This mission may or may not require a navigational capability depending on the distance and terrain involved. The possible requirement for navigational assistance indicates that it should be immediately available if the mission so dictates. The LMS would normally be operating behind the FEBA, however, when establishing contact, enemy units could be encountered and therefore vulnerability should be a consideration.

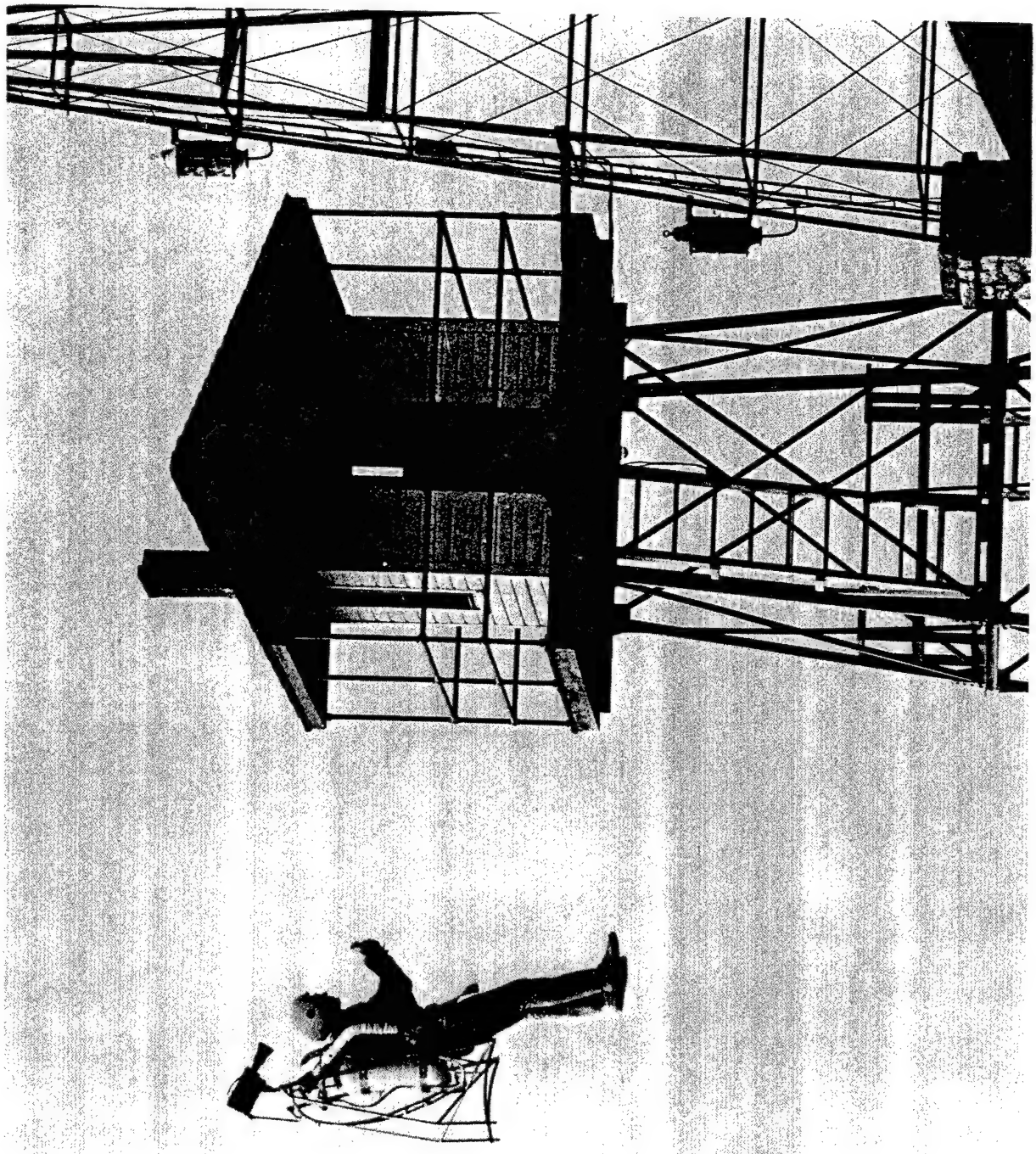

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Figure 6. Reaching High Point for Reconnaissance or to Emplace Radio Relay

In the movement of equipment or troops, ambush is always a possibility. The point and some forward elements are often allowed to pass through an ambush in order to bring effective fire on the main body of troops.

An airborne LMS would provide better security against ambush because of greater visibility. In many cases he would be able to spot enemy positions which would be invisible to the "earth-bound" point.

D. REAR AREA SECURITY

In this mission the LMS could provide early identification of an enemy threat in the rear. The capability of rapidly covering large areas of adverse terrain and landing for closer search would be invaluable. Enemy forces could threaten by the following means:

(1) Passing around flanks,

(2) Air-dropped or air-landed behind the FEBA

(3) Undiscovered units which are bypassed during an advance.

This operator would be behind the FEBA and vulnerability would not be a prime consideration; however, he could draw fire from detected enemy personnel. For a normal visual type mission, automatic stabilization should not be required. If the distances to be patrolled are short and the terrain provides good reference points, a navigational capability should not be required. It may be needed, however, to reach the area to be patrolled and for return to the base unit.

E. PSYCHOLOGICAL OPERATIONS

The LMS could be used as a rapid response means of conducting psychological operations. This would be most important in a counterinsurgency type war, since the LMS could:

(1) Disseminate leaflets.

(2) Broadcast propaganda messages from aerial loudspeakers

(3) Transport propaganda equipment such as small presses, radios, and movie projectors.

These operations could require flying over or into possible hostile areas. The site of the operation, type of terrain, and distances to cover could require a navigation capability. This being a rapid response system, the most opportune times could be used to perform the operation.

III. MOBILITY

A OVERFLY OBSTACLES

Natural obstacles such as rivers, cliffs and canyons, or man made obstacles such as radioactive contamination and minefields frequently slow or prevent the normal ground movement of troops. The LMS provides a rapid means of transporting key personnel over such obstacles. (Figure 7) These personnel could either operate the LMS themselves, or be carried as a passenger.

The system could also be used to assist in the preparation of a crossing operation such as lifting a rope or cable across a river or canyon or anchoring climbing ropes atop cliffs. These are nontactical moves and therefore vulnerability would not be a consideration. If a mission of this type was accomplished in areas where it might come under enemy fire, it would fall into another category, such as assault or reconnaissance. (See Figure 8.)

The operational distances are short and can be covered without navigational assistance. Automatic stabilization and radio should not normally be required.

B. SEARCH AND RESCUE

The mission requirement would be to locate and possibly retrieve lost individuals (downed aviators, or someone separated from a patrol). (See Figures 9 and 10.). This operation would normally take place beyond the FEBA but could occur within friendly areas. Flights beyond the FEBA would involve both survivability and navigational considerations. The requirement to fly search patterns may require a more sophisticated navigation system than required for other type missions. Communications equipment would also require consideration.

If an individual is to be retrieved, the system must have the capability of carrying a passenger. If the mission requires only search, the lost individual's location could be marked and reported so that immediate evacuation operations could be initiated. When supported by a rescue helicopter, a team of LMS vehicles could conduct the detailed search operation

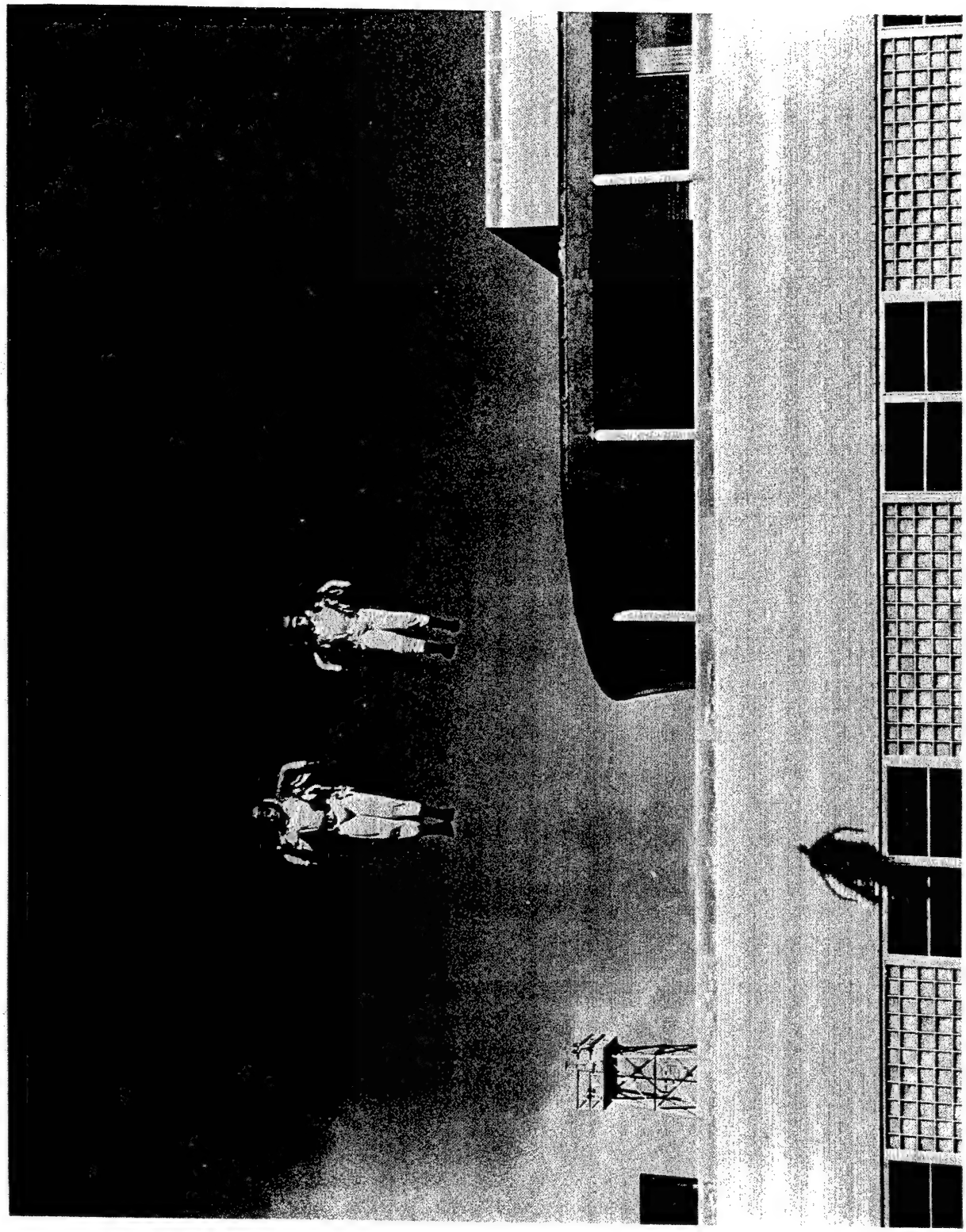

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Figure 7. Flying Over Buildings and Obstacles

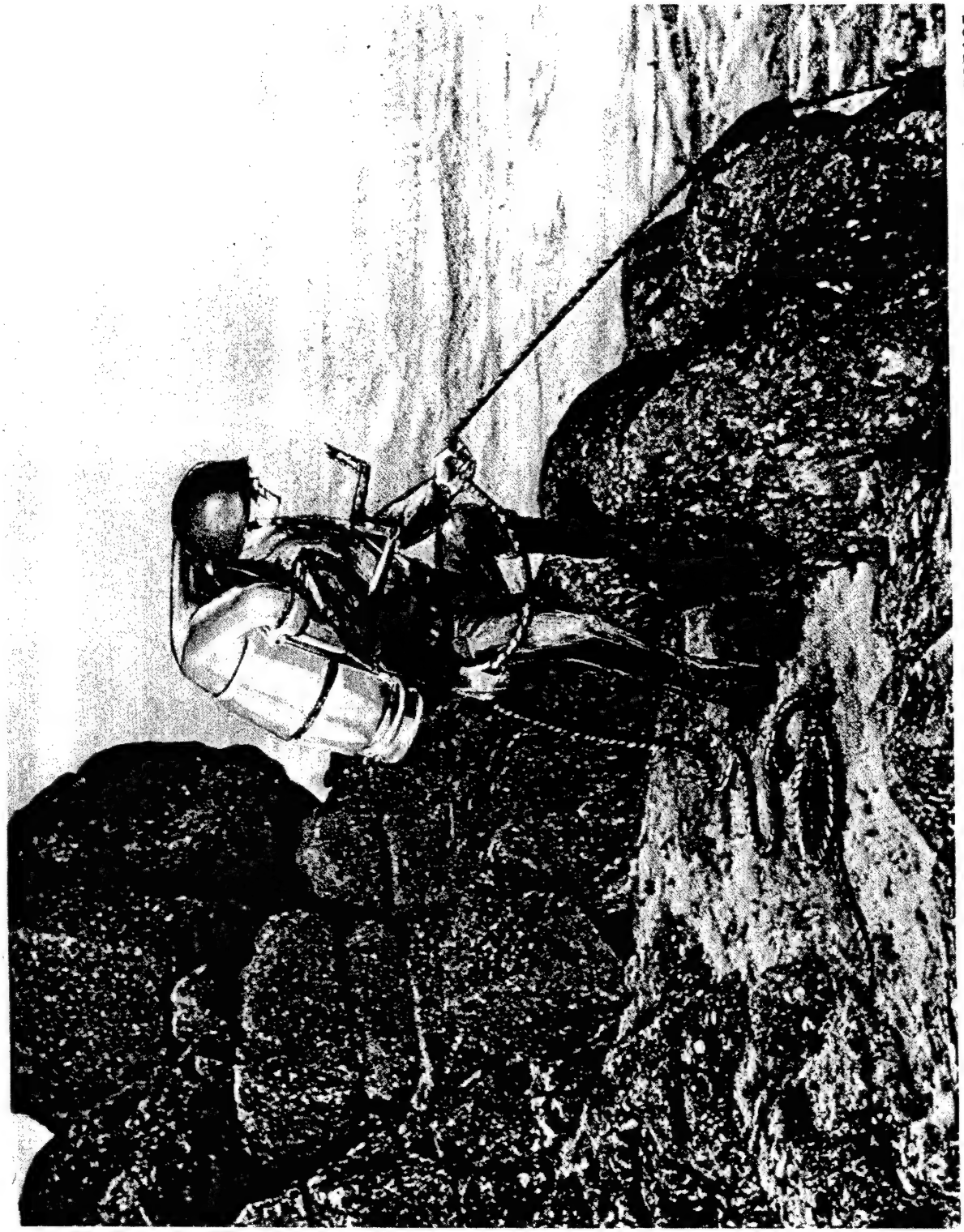

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Figure 8. Reaching Ordinarily Inaccessible Points

and then the supporting helicopter could perform the actual evacuation. (Figures 9 and 10).

C. ESCAPE ENEMY FORCES

This situation envisions a unit which has one or more organic Light Mobility Systems and has been trapped behind enemy lines or pinned down in an ambush. An operator could travel to a friendly unit to advise them of the situation and assist in leading them to his organization.

The operator would have the advantage of observing the tactical situation on the ground and would then get an aerial view on the way out. If required, an aerial reconnaissance could be performed prior to leaving the area, (Figure 12). This would allow him to describe the tactical situation to friendly units so that they could provide effective assistance. A navigation and communications capability would be required. Speed, size and maneuverability reduce vulnerability even in proximity to the enemy.

D. ASSAULT

The LMS can be used to move troops during the assault phase. (See Figure 13) A large number of troops could be positioned on or near the objective prior to the enemy recovering from the preparatory fire. The speed and aggressiveness of the assault would maximize the surprise and shock to the defending troops. The LMS could provide the mobility required to clear buildings and built-up areas of enemy forces.

Due to the short range, navigational assistance should neither be required nor would it be practical during the assault. Communications may be needed to maintain close control and initiate any maneuver changes.

The LMS can be used in connection with the movement of and the target location for armored units (Figure 14).

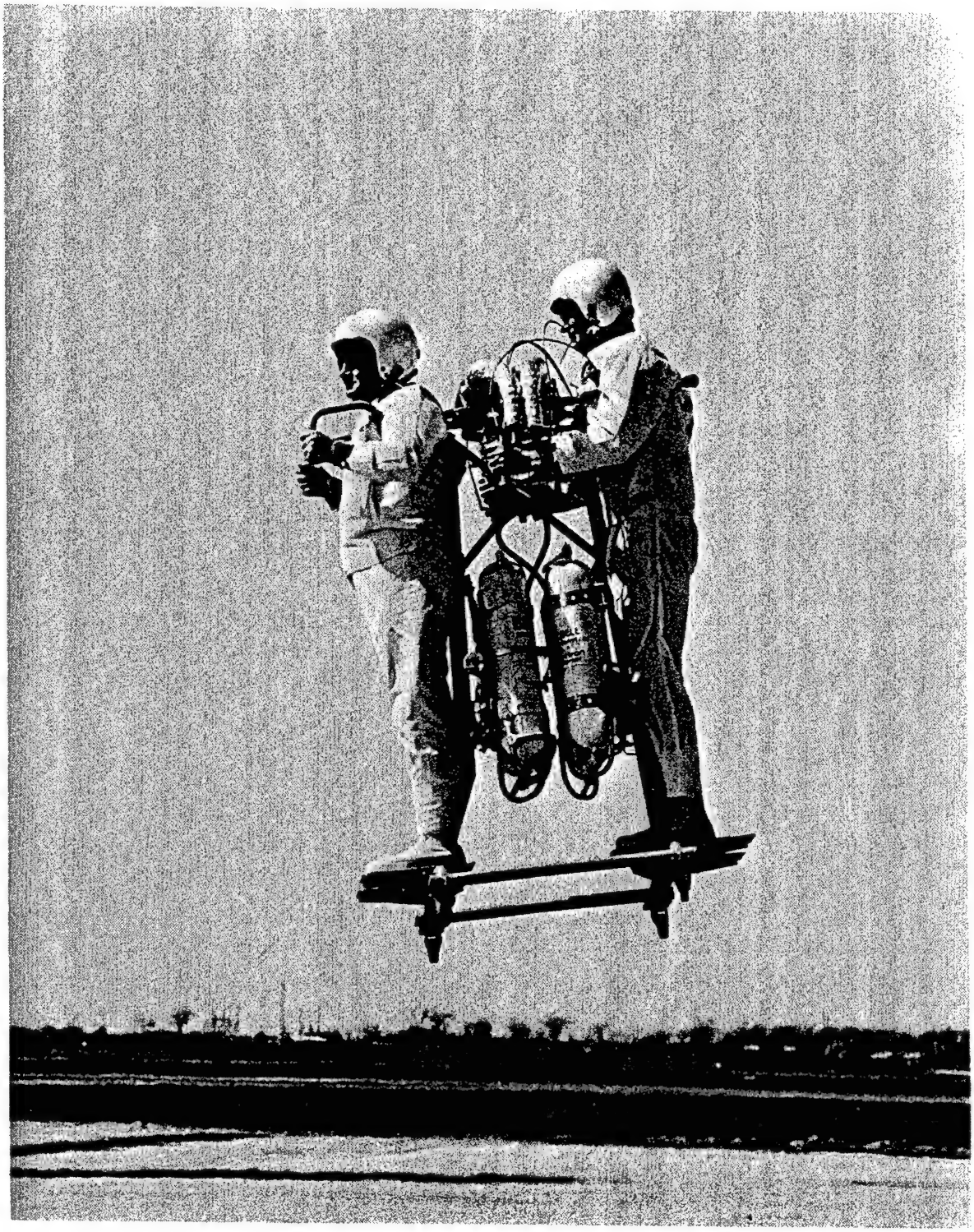

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Figure 9. Two-Man Pogo - Personnel Carrier, Command Vehicle, Medical Evacuation

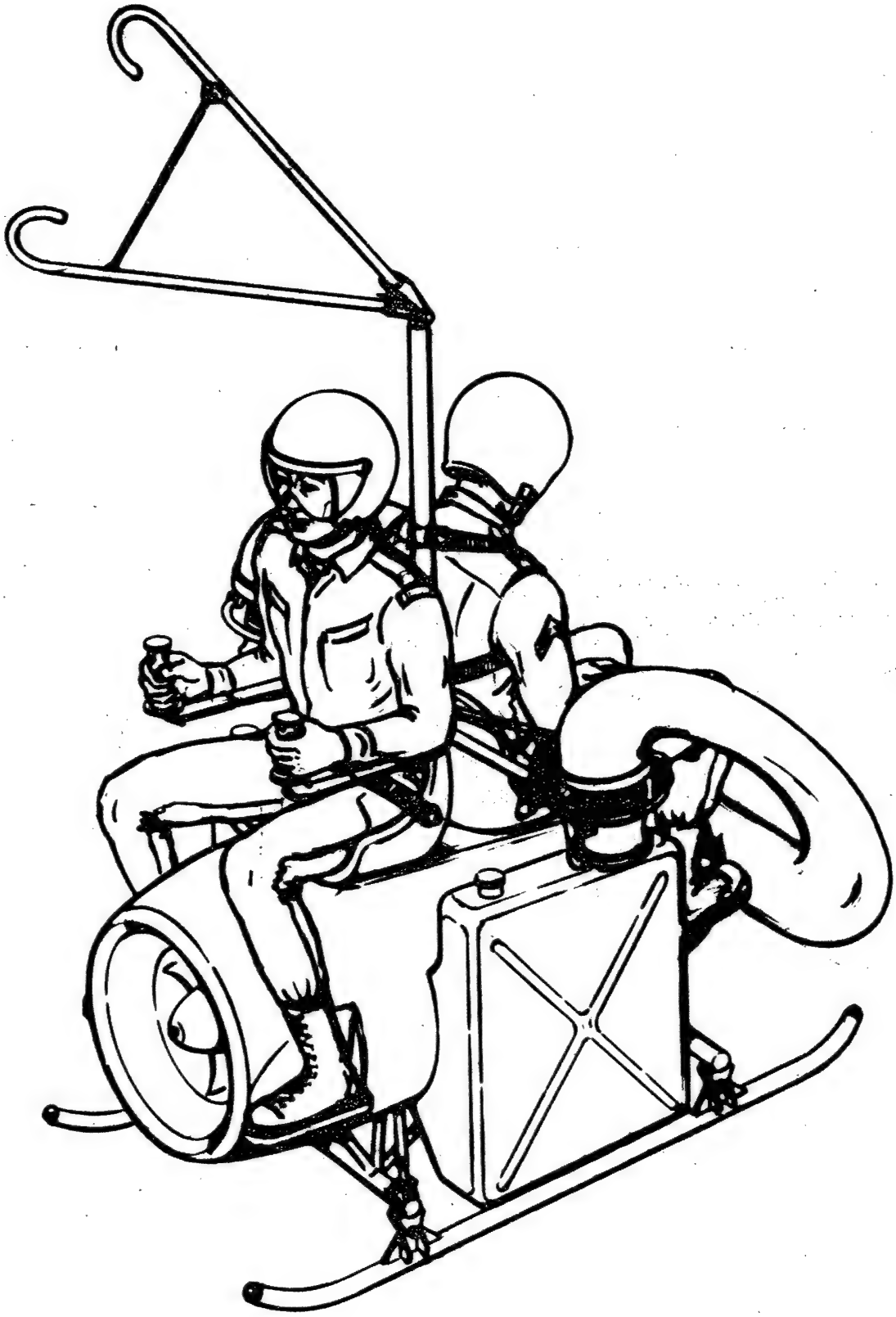

Figure 10. Airmobile - A Jet Vehicle to Carry Personnel or Equipment

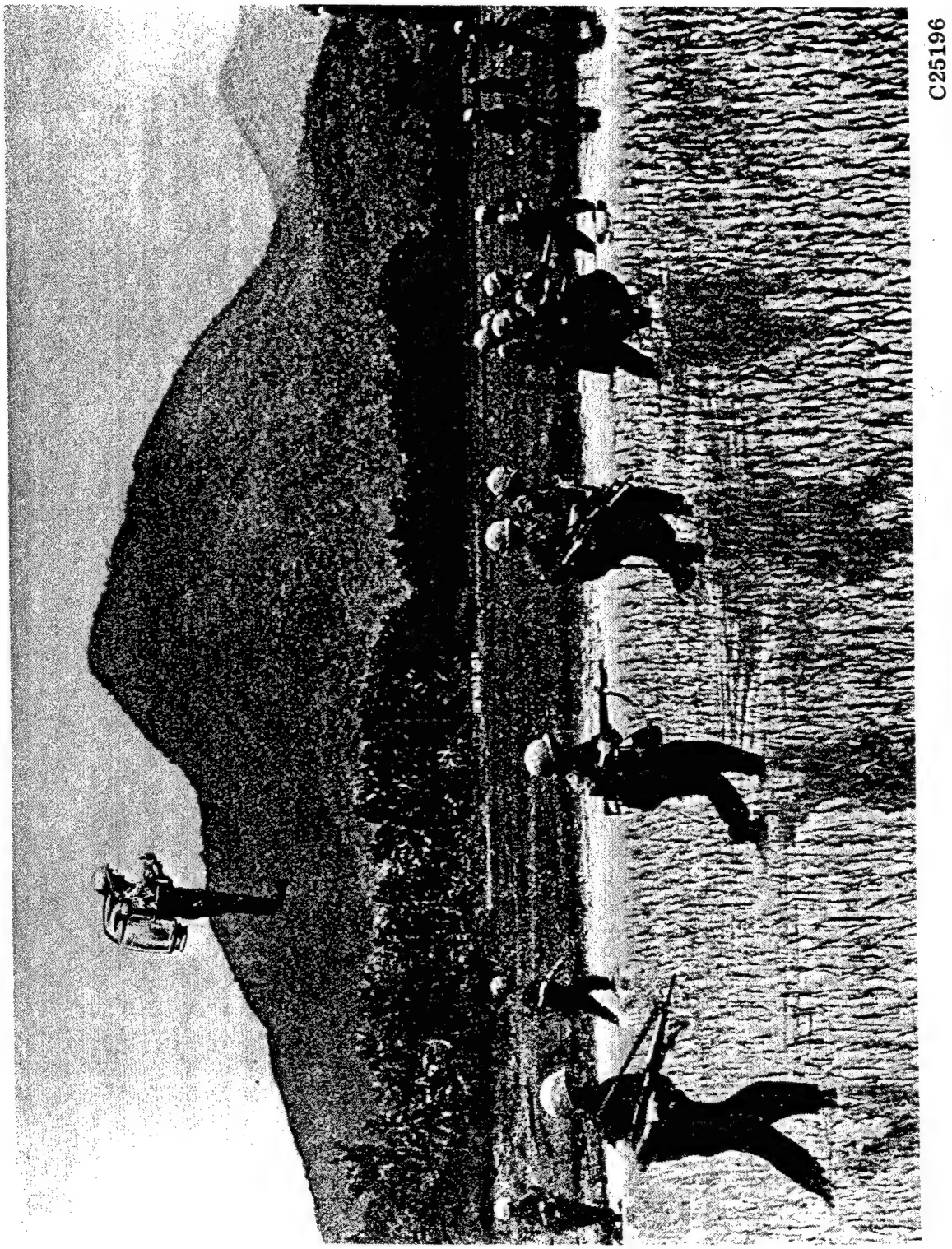

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Figure 11. Reconnaissance of Battle Situations

C25200

Figure 12. Assault from Offshore Ships

C25198

Figure 13. Point Security or Armor Fire Controller.

IV. FIREPOWER

A. AERIAL FIRE SUPPORT

In this application the LMS would become an airborne weapons platform. It could be used against both fixed targets of opportunity such as weapon emplacements and moving targets such as vehicles. It is envisioned as a rapid reaction system, readily available to the commander.

If the advance of a small unit was delayed by a roadblock, this would slow up and/or jeopardize the advance of larger units. The LMS could be dispatched to neutralize enemy automatic weapons fire which was pinning down or delaying the advance of friendly troops.

The armament used could be machineguns, rockets, air-dropped missiles or specially tailored weapons. The system could also be used to sow light antipersonnel mines. In this application, the weapon system should be light and have low recoil characteristics.

Vulnerability is a factor which could seriously affect LMS effectiveness when improperly employed. These are short range missions not far beyond the FEBA and could be accomplished without navigational aids. Communications may be required to coordinate and direct the attack.

At night the LMS could provide immediate flare support for a limited time and limited coverage. The standard air-dropped flares or suspended flares may be used. The suspended flare would be attached to a reflector which is carried under the LMS. This would permit a constant flare altitude to be maintained.

B. RAIDS

The raid may be conducted to obtain information on enemy defenses, to destroy enemy installations or positions, to capture or kill enemy personnel, to rescue friendly personnel, to harass or disrupt enemy operations, or to seize critical equipment. Helicopter support may be used when retrieving enemy equipment or personnel.

C25192

Figure 14. Counter Ambush Air Strike on Enemy Ambush Force

All raids would be beyond the FEBA and could be relatively long range. Vulnerability is a consideration and a navigational capability could be required. The transport of armament, explosives, personnel, or light equipment could be required. A communications system could be required to effectively coordinate the attack.

The LMS would be ideally suited for hit and run type tactical operations. It is a small, fast, highly mobile system which can readily adapt to conditions as they develop, strike, and then withdraw while the element of surprise is still in its favor.

C. FEINTS

A feint is a shallow, limited objective attack to mislead the enemy and draw him away from the main attack. The LMS would permit a fast-moving relatively deep attack with a rapid withdrawal after encountering stronger enemy resistance. The speed and mobility would allow immediate disengagement and preclude extended fire fights with stronger elements. The most opportune time can be used for withdrawal or redirection of the attack.

These operations would be beyond the FEBA so vulnerability and navigation must be considered. A communications system may be required for coordination.

D. GROUND FIRE SUPPORT

The LMS could position flanking or high ground area fire on enemy forces which are attacking or defending. Rifleman, machineguns, rockets, mortars, or recoilless rifle support could be positioned advantageously to support a combat operation. The system would be sufficiently responsive so that it could be repositioned, weapons could be placed where needed. This system could also be used to transport mines or demolition charges as they are required.

A navigational capability would not be required within a small radius of operation. Communications could be required to direct the equipment movement to the desired location at the proper time.

E. CHEMICAL, BIOLOGICAL AND RADIOLOGICAL

The LMS would be useful for small-scale chemical missions such as riot control agent delivery or laying smoke screens. The use of tear gas in counterinsurgency operations has proven to be quite successful and the LMS would provide a rapid responsive and accurate delivery system.

The jet turbine engine can easily be adapted to operate as an efficient flying smoke generator. Here again we would have a rapid response system capable of screening small scale movements (Figure 15).

These operations may be within range of enemy fire. If the radius of operation is small navigation assistance may not be required, however, movement to the area of operation may require navigational assistance. Communications may be required for coordination and direction.

C25194

Figure 15. Laying Smoke Screens or Gas

V. COMMAND CONTROL AND COMMUNICATIONS

A. TRANSPORT COMMANDERS

Unit commanders frequently have a requirement to inspect elements under their command, observe operations and camouflage, reconnoiter areas of possible operations or travel to their next higher level of command.

A commander trained to use the LMS has immediate and rapid mobility. The LMS would frequently be the only means under his control to adequately provide this type of transportation. At times it would be the only device capable of moving him because of terrain, weather, time or distance. The helicopter is not always available and because of terrain may not be capable of hovering or landing where required. The jeep, which is usually available, is greatly limited by terrain and is slow unless a good road net exists.

In a larger vehicle the commander may be transported as a passenger. Communications may be required to permit the commander to remain in contact with his unit. Navigation may be required when leaving this local area (Figures 9 and 10.)

B. ADMINISTRATIVE AND TACTICAL CONTROL

The operation of all combat units must be closely controlled. The commander and his subordinates know the plans for the organization and must assure that plans are being followed or altered if the situation changes.

There is also a requirement for a damage control capability. When damage occurs either because of enemy action or accidental reasons efforts must be made to control and assess the damage. The LMS provides an ideal platform for damage control and assessment.

If operation of the LMS is confined to the unit boundaries, navigational assistance would not be required. Communications would be required to effectively control the unit.

1. Administrative Control

Administrative control is the control exercised when the organization is not expected to encounter enemy activity. The LMS would be most useful when used to control the movement of a unit to a new location and the terrain over which the unit will move can

be closely observed. Immediate guidance can be given to lost or disabled vehicles. Although enemy activity is not expected, the LMS would provide point and flank security when operating in a combat zone. Communications with elements out of normal radio contact would also be maintained (Figure 16).

2. Tactical Control

Tactical control is exercised when an element is moving and known enemy forces are in the vicinity. The commander is particularly interested in the current situation so that efforts to counter enemy actions and protect his unit can be initiated immediately and coordinated. When the enemy is engaged, the LMS becomes an aerial observation post. It allows the commander the most positive control, because with real time inputs he sees what is happening (Figures 6 and 17). This tactic has been used frequently in Vietnam. It is effective in the counterinsurgency type operation, but may not prove feasible against a more sophisticated enemy. In this operation vulnerability should be considered.

C. MESSENGER AND COURIER

Messengers and couriers are frequently used between headquarters when other means of communications are either not established or are unreliable, or if other means cannot be used because of volume or security.

Speed is probably the most important parameter. Flights would normally be over secure areas so vulnerability considerations would not be important. A navigational capability may be required (Figure 17).

D. RADIO RELAY

Radio communication frequently cannot be established because of terrain, weather, or distance. The ability to rapidly position a radio relay above the terrain or to locate it on high points of the terrain can greatly extend the radio range and improve its reliability.

Because of its responsiveness, the LMS could provide a relay as required for urgent communications. Continuous communications could be established by using the LMS to pre-position a relay on high ground (Figure 6).

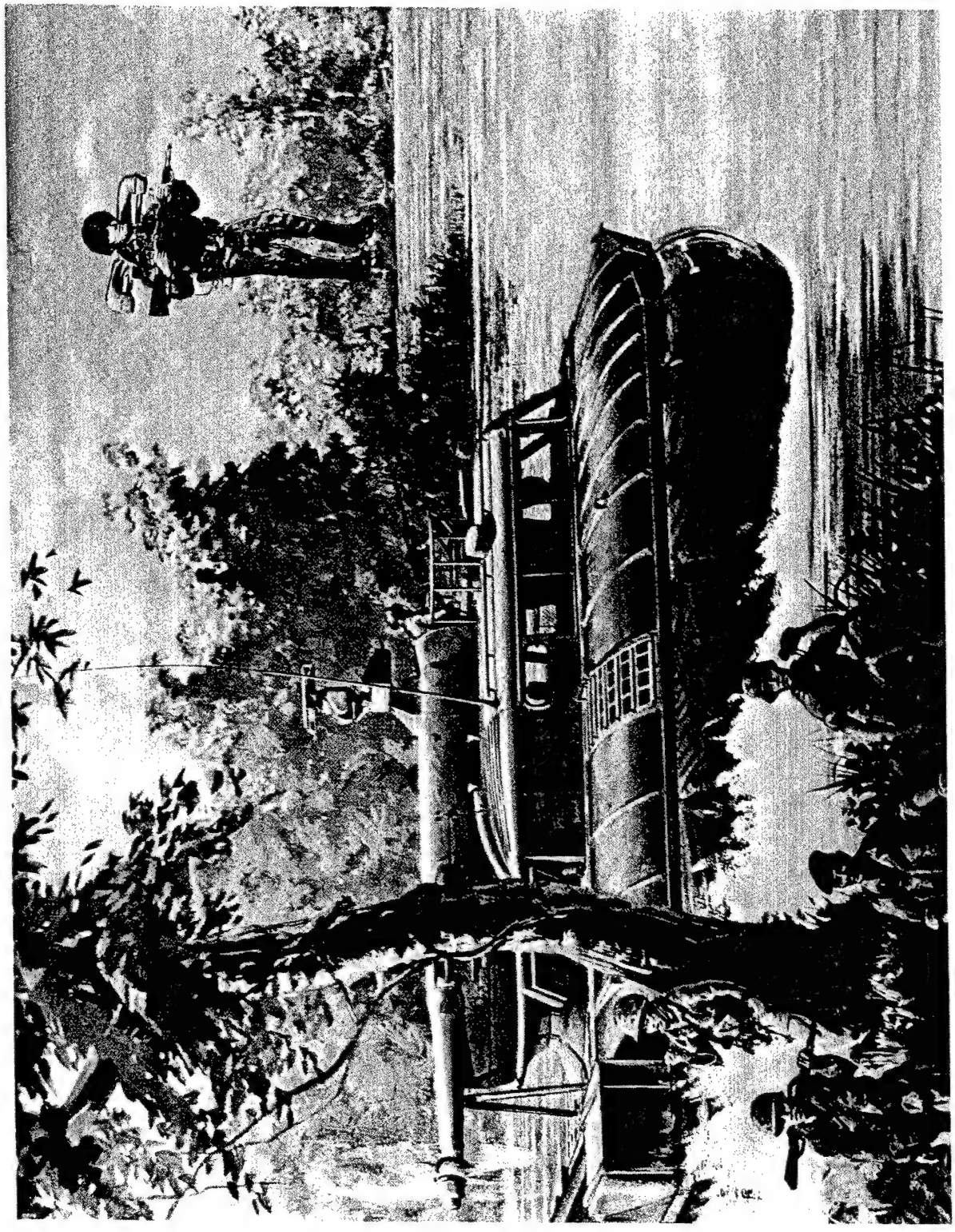

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Figure 16. Point Security, Amphibious Mission - Bell SK-5

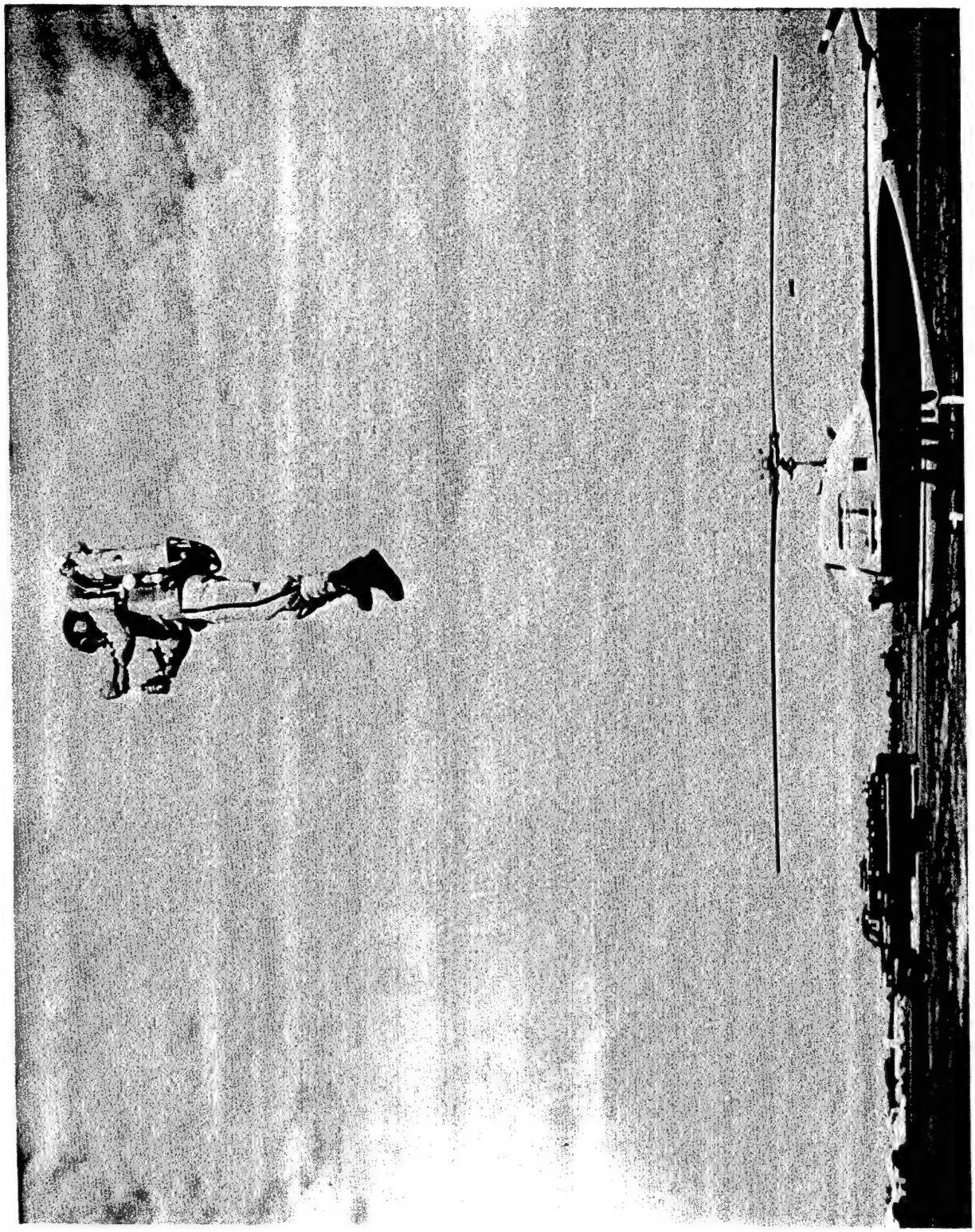

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Figure 17. Rapid Message Delivery and Other Missions for which Helicopter not Suited

E. WIRE LAYING

The LMS can lay wire rapidly over terrain which ground vehicles could not traverse, and men on foot could cover only with great difficulty and at a slow speed. The helicopter can accomplish the same mission; however, it is not readily available to the lower level units. The LMS gives responsive action, performing missions which would take much longer by other methods (Figure 18).

F. DANGER WARNING

Immediate danger warning such as for CBR contamination or natural disasters can be disseminated to isolated or disorganized units and civil populations by the LMS. The warning can be disseminated by loudspeakers, sirens, pyrotechnics, message drop, or voice.

These flights would normally be over friendly areas and would cover greater areas. A navigational capability may be required.

G. LIAISON

Liaison officers are required at higher and adjacent units to assure coordination and dissemination of information. These officers are particularly important when conducting air mobile, airborne, or amphibious operations as the planning and timing are extremely critical.

The LMS provides the rapid and responsive transportation to fully utilize the value of the liaison officer. The movement would normally be behind the FEBA, over secure areas. A navigational system may be required (See Figure 9, 10, and 19.)

H. PATHFINDER TEAMS

The pathfinder's mission is to aid in the terminal navigation and control of Army aircraft. The LMS could provide the means to move these teams to the objective area. This system would minimize the possibility of alerting the enemy when moving to the landing zone. The team would have the capability of rapidly departing the zone if threatened by enemy forces or if plans are changed.

Operations would be in the vicinity of enemy forces. Navigational assistance would be required to reach the proper landing zone and, if necessary, to return to a friendly area. Communications probably would be required to control the team.

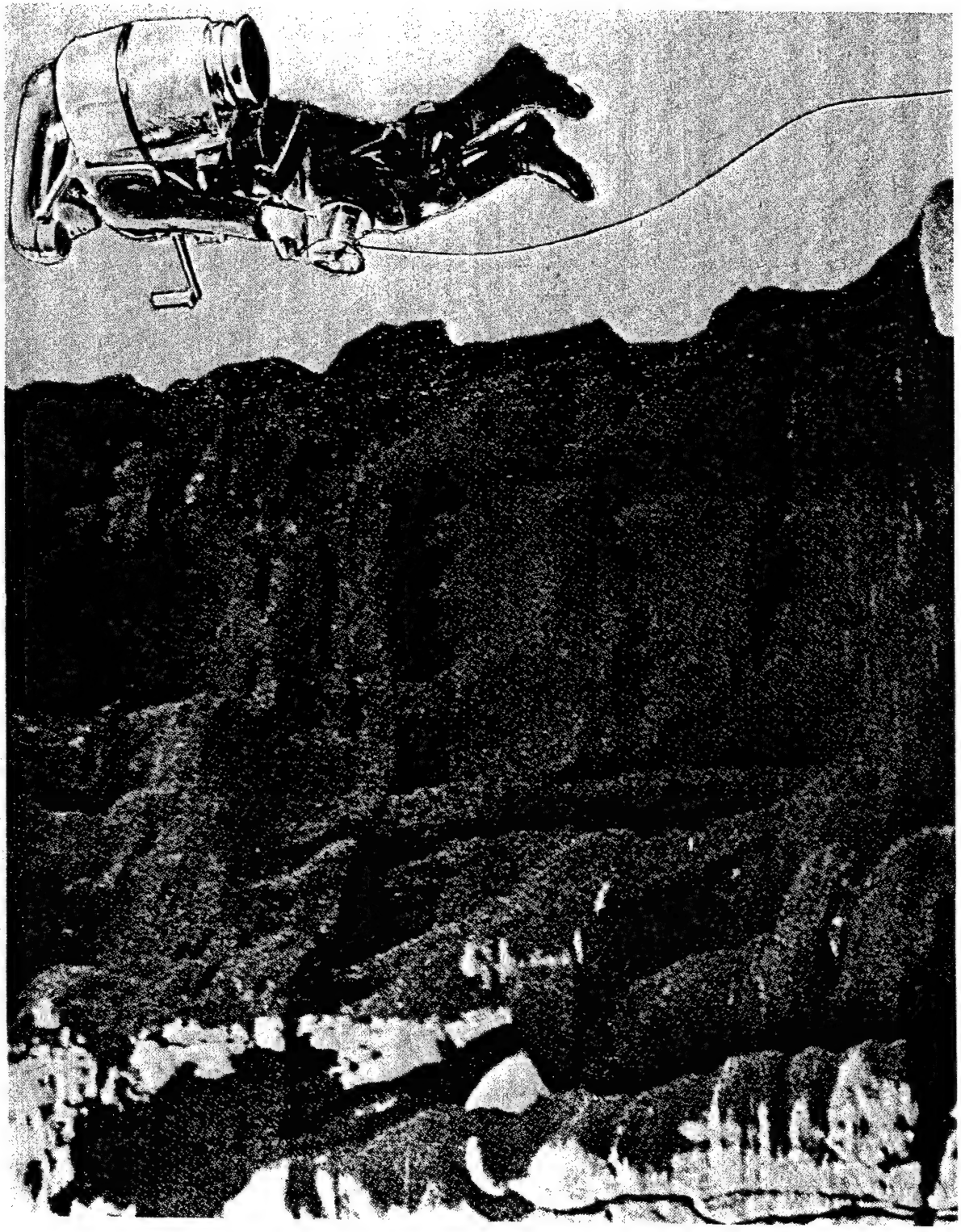

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Figure 18. Carrying Wire Reel Up Cliff Face

208029

Figure 19. Flying Chair Rocket System is Adaptable to Many New Concepts

VI. SERVICE SUPPORT

A. RESUPPLY

The LMS would not be utilized for resupply of large or heavy cargo which is handled through normal resupply channels. The LMS becomes valuable when a small lightweight item is immediately needed. Items such as blood plasma, a case of ammunition or a five-gallon can of water can favorably affect the outcome of a battle or the life of a person.

The ground vehicle can be used if good roads exist. The helicopter can be used if it is available and landing areas exist. Even under the most favorable conditions for these vehicles the LMS would be faster for short distances.

These flights would frequently be over or near combat areas. Because of the distance to be covered and the terrain navigational aids will often be required.

B. MOVE EQUIPMENT

This mission is similar to the resupply mission. The LMS would not be expected to transport heavy items and would move only critically needed lightweight items. The airmobile concept could be used to deliver equipment. (See Figure 9 and 10)

It could move mortars in the jungle where the only means of transportation is a man's back. It could also move items like a bazooka or flame thrower when urgently needed by isolated units or units beyond walking distance. Engineer demolition equipment could be moved to sites in or near enemy controlled areas. Operation would be near or beyond the FEBA thereby making vulnerability a consideration. Flights over longer distances and featureless terrain will require navigational assistance.

C. MEDICAL EVACUATION

The LMS could immediately remove critically injured individuals from front line or isolated units to hospital facilities. The capability of having the LMS standing by would greatly reduce evacuation time. Evacuation can take place in jungle terrain where a helicopter cannot land thus avoiding the necessity of men carrying the casualty or clearing

a landing area. If the field hospital is located far from the unit the LMS could transport the casualty to a centrally located medical evacuation helicopter.

This mission would require the capability for carrying a stretcher arrangement. Flights could be subjected to enemy fire and may require navigational equipment.

D. SURVEY

1. Topographic Survey

The LMS could support topographic survey operations in three ways:

(a) It can provide an aerial reconnaissance capability for ground crews

(b) It can transport personnel and equipment to areas which are difficult to reach on foot or by ground vehicle.

(c) It can become an integral part of the actual survey by using aerial trilateration or inertial surveys.

Enemy fire should not be encountered and the short ranges would not require navigational equipment.

2. Artillery Survey

The artillery survey objectives are to obtain direction, range and difference in elevation from gun to target. By hovering over preplanned points the required information can be obtained. The aerial method would be used when large scale maps of the area are not available or the terrain or tactical situation is such that ground parties cannot provide a timely survey.

The survey operation would normally be over secure areas and should not be subjected to enemy fire. Communications may be required to control the location of the hovering points and the time of hover. (Figure 20.)

3. Chemical, Biological and Radiological Survey

A CBR survey is conducted to determine the extent and degree of contamination in a given area.

The LMS is responsive to the lowest Army command unit. It can cover a large area in a shorter time than could be traversed by a ground party. The altitude can be

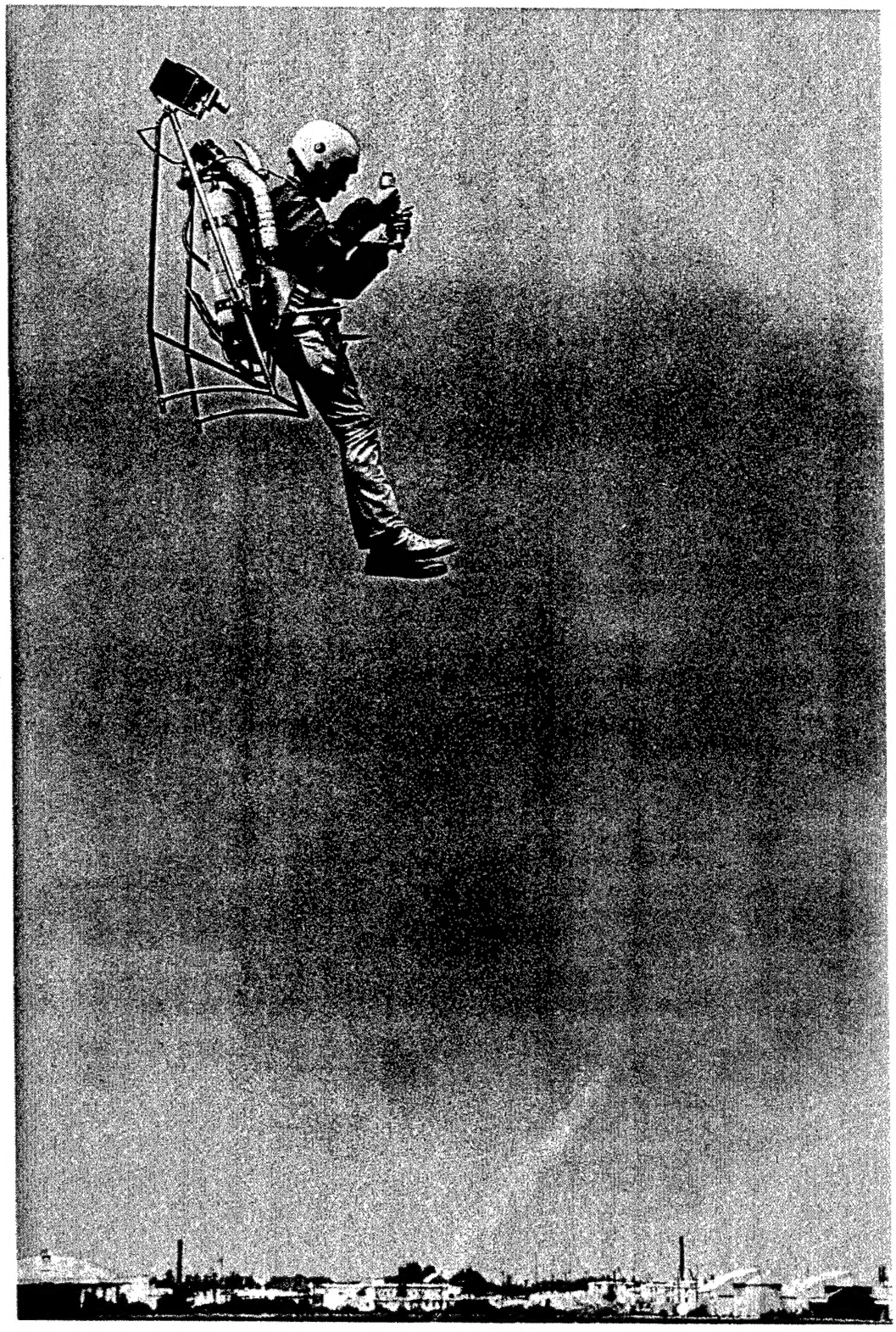

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Figure 20. Artillery Spotting or Photographing Enemy Terrain

adjusted to allow an area to be covered which has an unacceptable dose rate for ground personnel. It can also cover areas not readily accessible. This method is less accurate because of varying altitude and ground speed, but gives the immediate preliminary information required for planning. The operator can also be subjected to enemy fire. Navigational equipment is required for the more distant missions.

E. CLEAR MINE FIELDS

The ability of the LMS to hover makes it valuable for clearing mine fields. Detection equipment can be moved over the field. Detonation devices can also be pulled over the field from a safe distance. Hooks can be pulled through areas of trip wires or rollers can be pulled over pressure sensitive fuses. Mine locations and patterns may be detected visually from the air. Enemy fire may be encountered.

CONCLUSION

The preceeding pages have described in detail the many missions that the Light Mobility System could perform. Its versatility and responsiveness would enable Unit Commanders to utilize the unique capabilities of the LMS in virtually all combat environments. Figure 21 is an artist's concept presenting a typical mission spectrum for the LMS in a forward battle area.

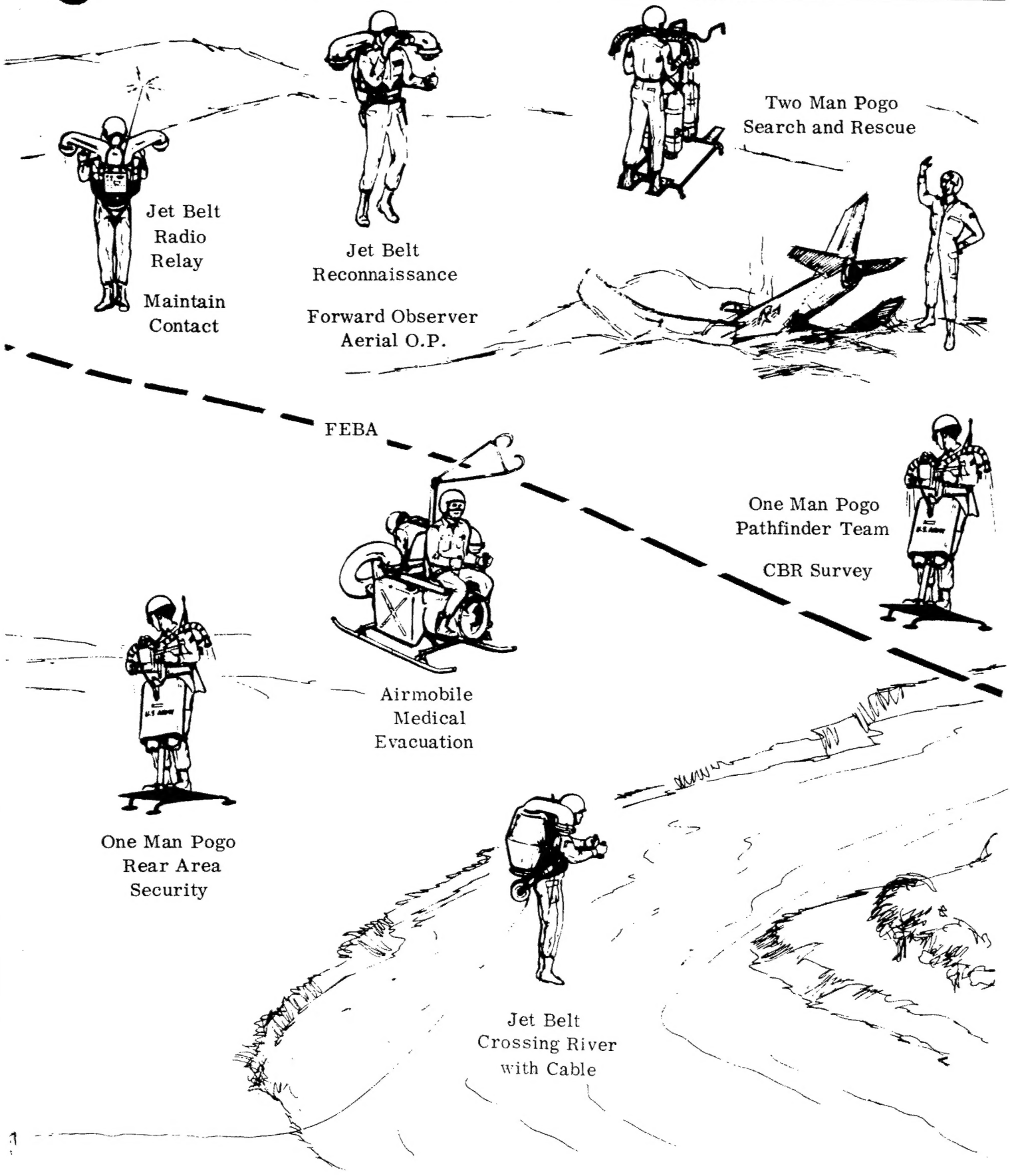
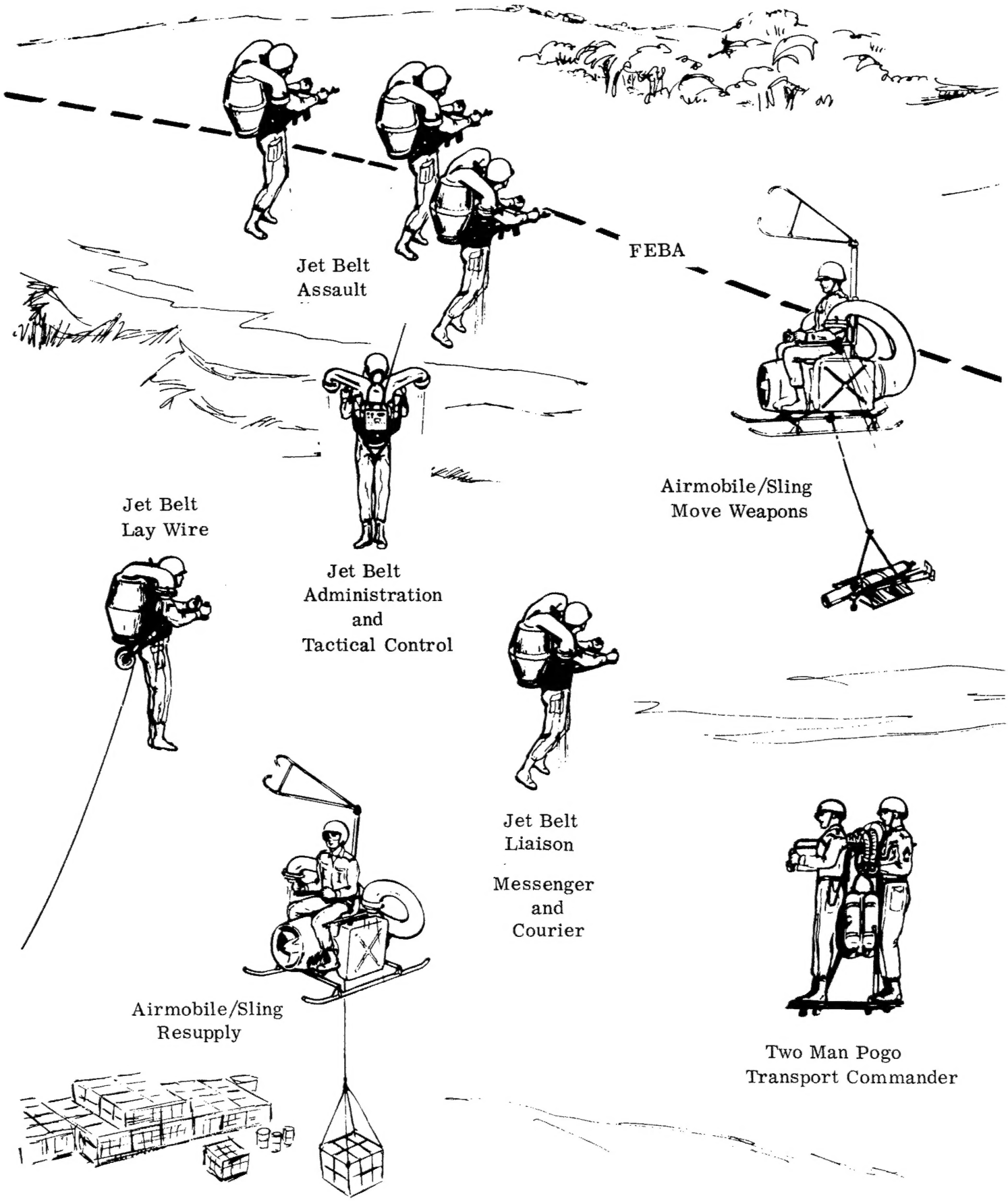


Figure 21. Light Mobility Systems Mission Spectrum



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